

Claims

1. A method of activating a getter structure, comprising:
illuminating a photomask having a transmissive region substantially
5 aligned with the getter structure;
transmitting a portion of said photons through, said transmissive region;
absorbing said photons, transmitted through said transmissive region, in
the getter structure; and
heating the getter structure with said absorbed photons.
10
2. The method in accordance with claim 1, wherein heating the getter
structure further comprises heating the getter structure to at least the activation
temperature of the getter structure.
- 15 3. The method in accordance with claim 1, further comprising
positioning said photomask wherein said transmissive region is substantially
aligned over said getter structure.
- 20 4. The method in accordance with claim 3, wherein positioning said
photomask further comprises:
translating said photomask in a first direction; and
translating said photomask in an orthogonal direction to said first
direction.
- 25 5. The method in accordance with claim 4, further comprising
rotating said photomask about a center of rotation.
- 30 6. The method in accordance with claim 4, further comprising
rotating said photomask in the plane formed by said first and said orthogonal
direction.

7. The method in accordance with claim 3, wherein positioning said transmissive region further comprises adjusting said photomask to be a specified distance from said getter structure.

5 8. The method in accordance with claim 1, wherein illuminating said photomask further comprises illuminating a partially transmissive region formed in said photomask with photons emitted from a photon source and incident on said photomask.

10 9. The method in accordance with claim 8, wherein illuminating said partially transmissive region further comprises:

transmitting a portion of said photons incident on said partially transmissive region; and

absorbing said portion of said transmitted photons in a specified portion
15 of a substrate or a device package material on which the getter structure is disposed, wherein said specified portion of said substrate or said device package material substantially aligns with said partially transmissive region.

20 10. The method in accordance with claim 9, further comprising heating said specified portion of said substrate or said device package material.

25 11. The method in accordance with claim 1, wherein illuminating said photomask further comprises illuminating a grating photomask having at least one transmissive region and at least one non-transmissive grating region.

12. The method in accordance with claim 11, wherein illuminating said grating photomask further comprises illuminating a quarter wavelength grating region disposed on said grating photomask.

30 13. The method in accordance with claim 11, wherein illuminating said grating photomask further comprises illuminating a grating photomask having at least one partially transmissive grating region disposed on said grating photomask.

14. The method in accordance with claim 1, wherein illuminating said photomask further comprises illuminating a reflective photomask having at least one transmissive region and at least one reflective substantially non-transmissive region.

5

15. The method in accordance with claim 14, wherein illuminating said reflective photomask further comprises illuminating said reflective photomask having at least one partially reflective region.

10

16. The method in accordance with claim 1, wherein illuminating said photomask further comprises illuminating an absorptive photomask having at least one transmissive region and at least one absorptive non-transmissive region.

15

17. The method in accordance with claim 17, wherein illuminating said reflective photomask further comprises illuminating a reflective photomask having at least one partially transmissive absorptive region.

20

18. The method in accordance with claim 1, wherein illuminating said photomask further comprises illuminating a photomask having:
at least one transmissive region;
at least one non-transmissive region; and
at least one partially transmissive region.

25

19. The method in accordance with claim 1, wherein illuminating said photomask further comprises illuminating said photomask with photons emitted from a photon source, said photon source emitting photons in substantially the infrared region of the electromagnetic spectrum.

20. The method in accordance with claim 1, wherein transmitting said portion of said photons further comprises transmitting a portion of said photons through a transmissive region formed in a reflective film disposed on said photomask.

5

21. The method in accordance with claim 20, further comprising transmitting said photons through said transmissive region of said reflective film deposited on a glass or polymer photomask substrate.

10

22. The method in accordance with claim 1, wherein illuminating said photomask further comprises illuminating said photomask disposed on a device package surface.

23. The method in accordance with claim 22, further comprising
15 removing said photomask from said device package surface.

24. The method in accordance with claim 23, wherein removing said photomask further comprises removing a release layer disposed between said device package surface and said photomask.

20

25. The method in accordance with claim 22, further comprising illuminating a reflective film disposed on said photomask disposed on said device package surface.

26. The method in accordance with claim 25, further comprising
25 removing said reflective film from said device package surface.

27. The method in accordance with claim 26, wherein removing said reflective film further comprises removing said reflective film disposed on a
30 exterior package surface, wherein said getter structure is disposed on an opposing interior package surface.

28. The method in accordance with claim 26, wherein removing said reflective film further comprises chemically etching said reflective film.

29. The method in accordance with claim 26, wherein removing said
5 reflective film further comprises removing a release layer disposed between said device package surface and said reflective film.

30. The method in accordance with claim 22, wherein illuminating said photomask further comprises illuminating a grating photomask disposed on said
10 device package surface.

31. The method in accordance with claim 30, wherein illuminating said grating photomask further comprises:
illuminating at least one substantially transmissive region; and
15 illuminating at least one substantially non-transmissive region.

32. The method in accordance with claim 30, wherein illuminating said at least one substantially non-transmissive region further comprises illuminating a quarter wavelength grating.
20

33. The method in accordance with claim 30, further comprising illuminating at least one partially transmissive region.

34. The method in accordance with claim 33, wherein illuminating said
25 at least one partially transmissive region further comprises illuminating at least one partially transmissive region that transmits in the range from about 10 percent to about 90 percent of the photons impinging upon said partially transmissive region.

30 35. The method in accordance with claim 1, wherein illuminating said photomask further comprises illuminating a grating or a reflective photomask.

36. The method in accordance with claim 1, wherein absorbing said photons, further comprises absorbing said photons transmitted through said transmissive region in said photomask and transmitted through a substrate forming a portion of a device package, wherein the getter structure is disposed on an interior surface of said device package.

37. The method in accordance with claim 1, wherein heating the getter structure further comprises heating the getter structure disposed on an interior surface of a device substrate, said device substrate forms a portion of a package enclosing the getter structure.

38. The method in accordance with claim 1, wherein heating the getter structure further comprises heating the getter structure enclosed within a device package.

39. The method in accordance with claim 1, wherein heating the getter structure further comprises heating the getter structure having a suspended mass portion suspended over a cavity formed in a device substrate.

40. The method in accordance with claim 1, wherein heating the getter structure further comprises heating the getter structure having a free standing portion and at least one additional getter layer disposed over and separated by a gap from said free standing portion, said free standing portion suspended over a cavity formed in a substrate.

41. The method in accordance with claim 1, wherein heating the getter structure further comprises heating the getter structure having an absorption layer disposed between the getter structure and a substrate or device package material.

42. The method in accordance with claim 1, wherein heating the getter structure further comprises heating the getter structure disposed on a substrate or device package part, wherein said substrate or device package part includes
5 a trench formed in said substrate or device package part and said trench encircles the getter structure.

43. The method in accordance with claim 1, further comprising reactivating the getter structure at a specified pressure.
10

44. The method in accordance with claim 1, further comprising reactivating the getter structure after a specified time.

45. The method in accordance with claim 1, wherein transmitting said
15 portion of said photons further comprises transmitting said portion of said photons through said substrate.

46. A method of making a device, comprising:
creating a getter structure on a substrate or a device component part of a
20 device package;
creating a photomask on a surface of either said substrate or of said device component part; and
activating said getter structure by the method of claim 1.

25 47. The method in accordance with claim 46, further comprising sealing said device package.

48. The method in accordance with claim 46, wherein creating said getter structure further comprises creating a getter structure utilizing a material
30 selected from the group consisting of Zr-V-Ti alloys, Zr-V-Fe alloys, Zr-Al alloys and mixtures thereof.

49. The method in accordance with claim 46, wherein creating said getter structure further comprises creating a getter structure utilizing a material selected from the group consisting of zirconium, thorium, hafnium, vanadium, yttrium, niobium, tantalum, molybdenum, terbium, and mixtures thereof.

5

50. The method in accordance with claim 46, wherein creating said getter structure further comprises creating a thermally isolated getter structure.

51. The method in accordance with claim 46, wherein creating said
10 getter structure further comprises creating a getter structure having a suspended mass portion suspended over a cavity formed in said substrate or in said device component part.

52. The method in accordance with claim 46, wherein creating said
15 getter structure further comprises creating a getter structure having a free standing portion and a second getter layer disposed over and separated by a gap from said free standing portion, said free standing portion suspended over a cavity formed in said substrate or in said device component part.

20 53. The method in accordance with claim 46, wherein creating said getter structure further comprises creating a getter structure having an absorption layer disposed between said getter structure and said substrate or said device component part.

25 54. The method in accordance with claim 46, wherein creating said getter structure further comprises creating a getter structure disposed on said substrate or said device component part, wherein said substrate or said device component part includes a trench formed therein, and said trench encircles the getter structure.

55. The method in accordance with claim 46, wherein creating said getter structure further comprises forming said getter structure by inkjet deposition.

5

56. The method in accordance with claim 46, wherein creating said photomask further comprises creating a reflective photomask.

57. The method in accordance with claim 46, wherein creating said photomask further comprises creating a quarter wavelength grating photomask.

10

58. The method in accordance with claim 46, wherein creating said photomask further comprises creating an absorptive photomask.

59. The method in accordance with claim 46, wherein creating said photomask further comprises micromolding said photomask.

15

60. The method in accordance with claim 59, further comprising attaching said photomask to said surface of either said substrate or of said device component part.

20

61. The method in accordance with claim 46, wherein creating said photomask further comprises creating a photomask having transmissive and non-transmissive regions.

25

62. The method in accordance with claim 46, wherein creating said photomask further comprises creating a photomask having transmissive, non-transmissive regions and partially transmissive regions.

63. The method in accordance with claim 46, wherein creating said photomask further comprises etching a photomask on said surface of either said substrate or of said device component part.

30

64. The method in accordance with claim 46, wherein creating said photomask further comprises coating or solution casting a polymer on said surface of either said substrate or of said device component part.

5

65. The method in accordance with claim 46, wherein activating said getter structure further comprises illuminating a photomask having:

- at least one transmissive region;
- at least one non-transmissive region; and
- at least one partially transmissive region.

10

66. A method of activating a getter structure disposed in a device, comprising:

illuminating a vacuum device with photons emitted from a photon source, said vacuum device having the getter structure disposed over a substrate;

15

transmitting a portion of said photons through a transmissive region substantially aligned with the getter structure, said transmissive region formed in a photomask disposed between the getter structure and said photon source;

20

and

heating the getter structure above its activation temperature.

67. A method of activating a getter structure disposed in a device, comprising:

uniformly illuminating the device with photons emitted from a photon source, wherein the getter structure is disposed over or on a substrate forming a portion of the device;

25

transmitting a portion of said photons through a transmissive region formed in a photomask, said transmissive region substantially aligned with the getter structure;

30

heating the getter structure above the activation temperature of the getter structure with absorbed photons.

68. The method in accordance with claim 67, further comprising positioning said transmissive region over the getter structure.

5 69. The method in accordance with claim 68, wherein positioning said transmissive region further comprises:

translating said photomask in a first direction;

translating said photomask in an orthogonal direction to said first direction;

10 rotating said photomask about a center of rotation.

70. The method in accordance with claim 67, wherein illuminating the device further comprises illuminating a grating photomask having at least one transmissive region and at least one non-transmissive region.

15

71. The method in accordance with claim 70, wherein illuminating said grating photomask further comprises illuminating at least one partially transmissive grating region disposed on said grating photomask.

20 72. The method in accordance with claim 67, wherein illuminating the device further comprises illuminating a reflective photomask having at least one transmissive region and at least one non-transmissive reflective region.

25 73. The method in accordance with claim 70, wherein illuminating said reflective photomask further comprises illuminating at least one partially reflective transmissive region disposed on said reflective photomask.

30 74. The method in accordance with claim 67, wherein transmitting said portion of said photons further comprises transmitting a portion of said photons through said transmissive region formed in said photomask disposed on the device.

75. The method in accordance with claim 74, further comprising removing said photomask from the device.

5 76. The method in accordance with claim 67, wherein illuminating said device further comprises illuminating a device having a getter structure disposed over a silicon substrate.

10 77. The method in accordance with claim 76, further comprising illuminating said getter structure through said silicon substrate.

78. The method in accordance with claim 67, further comprising transmitting a portion said photons through said substrate.